Final Report

HARVESTING BUDWORM-DAMAGED STANDS FOR FUEL

YORK-SUNBURY-CHARLOTTE

FOREST PRODUCTS MARKETING BOARD

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Canada/New Brunswick Conservation and Renewable Energy Demonstration Program

The Conservation and Renewable Energy Demonstration Program Program is administered in New Brunswick by the Energy Secretariat and managed jointly with Energy, Mines and Resources Canada. The Program is designed to help demonstrate promising conservation and renewable energy technologies, to develop public awareness and understanding of these technologies, and to create employment in new or existing industries.

Through over 100 demonstration projects in New Brunswick, a wide variety of conservation and renewable energy technologies have proven to be technically sound and economically attractive. These demonstration projects should now provide a catalyst for commercialization and lead to widespread adoption of many of these proven technologies.

This final report is based on a project which was financially supported by the Energy Demonstration Program. For further information on other demonstration projects funded in New Brunswick under this program, contact:

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Le succès ainsi rencontré encourage la commercialisation des procédés les plus accessibles. Cela entrainerait certes l'adoption d'un grand nombre de ces techniques par les propriétaires de domiciles et par l'industrie privée.

Ce rapport final est basé sur un projet qui a reçu une aide financière du Programme de démonstration. Pour de plus amples renseignements, communiquez avec la:

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D I S C L A I M E R

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TABLE OF CONTENTS

EXECUTIVE SUMMARY.....Page 1

INTRODUCTION.....Page 2
- General.....Page 2
- Objectives.....Page 2
- Alternatives and Constraints.....Page 3

DESCRIPTION AND RESULTS.....Page 6
- Description of Field Work.....Page 6
- Results.....Page 7

CONCLUSIONS.....Page 11

RECOMMENDATIONS.....Page 13

REFERENCES.....Page 16

APPENDIX.....Page 17
- Proposal.....Page 18
- Cost Schedule.....Page 20

HARVESTING BUDWORM-DAMAGED

STANDS FOR FUEL

EXECUTIVE SUMMARY

This project was initiated to demonstrate the economics and logistics of harvesting budworm-damaged stands for use as fuel. Dead spruce (Picea spp.) and balsam fir (Abies balsamea) (L.) Mill.) were to be harvested from small private woodlots in southwestern New Brunswick using an integrated, full-tree harvesting system to produce wood chip fuel and other forest products.

Major difficulties in locating suitable harvesting sites that were compatible with the proposed logging system forced the termination of the demonstration before any harvesting began. It does not appear to be feasible at this time to harvest dead wood from private woodlots in the manner that was attempted.

This report documents the objectives and background of the study, and reviews the work done prior to termination of the project. Recommendations for future consideration are examined.

RESUME

Ce projet avait pour but de démontrer l'aspect économique et logistique d'utiliser comme combustible les arbres détruits par la tordeuse des bourgeons d'épinette. On devait ramasser les épinettes (Pinea spp.) et les sapins baumier (Abies balsamea (L.) Mill.) morts des lots boisés privés dans le sud-ouest du Nouveau-Brunswick en utilisant un système intégré d'exploitation en arbres entiers pour produire des copeaux de bois et d'autre produits forestiers.

En raison des difficultés recontrées lors du choix d'un site compatible avec le système à tronçonner qui était proposé, la démonstration a dû être terminée avant que la cueillette ne commence. Présentement, il ne semble pas être rentable de ramasser (tel que demontré dans ce projet) le bois mort des lots privés.

Dans ce rapport, vous trouverez les objectifs et de la documentation sur l'étude ainsi qu'une explication du travail entrepris avant la fin du projet. Des recommendations pour de futures initiatives seront aussi étudiées.

INTRODUCTION

General

The spruce budworm infestation in New Brunswick has damaged many spruce-fir stands and created a large volume of dead fibre, that in many areas of the province is not being utilized. The private woodlots in Charlotte county have been moderately to completely defoliated, and represent a potential supply for a regional wood chip fuel industry. The Energy Secretariat of the Province of New Brunswick, in an effort to generate investment in the wood energy field, started a demonstration study of the feasibility of harvesting dead wood from small freeholds in Charlotte county. The study was administered by the York-Sunbury-Charlotte Forest Products Marketing Board. The plan was to harvest 3000 green tonnes of wood chip fuel produced from dead trees on private woodlots, and then market the wood chips regionally. Extensive monitoring of all phases of the project was to take place.

Objectives

The objectives of the study were:

2-1 to determine the costs, productivity, and mechanics of using a full-tree harvesting system to harvest dead spruce and fir from private woodlots in Charlotte county; to produce the wood chips in conjunction with the harvesting of other forest products (ie. an integrated system).

2-2 to collect other production-related information such as; the average moisture content, bulk density, ash content and calorific value of the wood chips; the effects of changes in stand, terrain and market conditions on the economics of harvesting and delivery; a detailed inventory of cutting site prior to harvesting.

2-3 to examine the benefits and/or drawbacks of the harvesting system on postcut silvicultural operations.

2-4 to encourage the production and use of the wood chip fuel locally.

2-5 to encourage, by way of demonstration, more intensive management of the private woodlot resources in Charlotte county.

2-6 to prescribe postcut silvicultural operations in accordance with the management objectives of the woodlot owner.

Alternatives and Constraints

3-1 Harvesting Equipment Since the economics of harvesting budworm-killed trees for chipping at roadside were not well documented, no consideration was given to purchasing or modifying harvesting equipment for the study. The intent was to contract out all phases of harvesting and delivery, preferably on a local basis, since excessive equipment floating would be expensive. Interested contractors in Charlotte county indicated that a Morbark 22 Chiparvestor (full-tree chipper) with a separate loader, 100 HP class cable skidders, chip vans, and trucks for hauling roundwood would be available for use during the demonstration.

Various pieces of "small technology" harvesting equipment, such as four-wheel drive articulated tractors and tractor-mounted chippers, were considered but were deemed inappropriate for this project due to their low rates of production and relatively high fixed and operating costs.

3-2 Site Selection There was not a strict set of limitations placed on harvesting site selection, however there were general guidelines formulated to govern the selection process. Cut blocks were to be about twenty hectares in size so that harvesting could take place in a number of locations. This approach would have allowed for production studies under variable stand and terrain conditions. Stands that were predominately softwood were given top priority, however any woodlot with a dead standing volume of 25 percent or more was considered. The market for the chips was in Woodland, Maine, hence preference was given to sites that were closest to the border crossing at St. Stephen, New Brunswick. Locations that were characterized by extreme terrain conditions (ie. poor drainage, extreme slopes, etc.) were avoided during site selection.

The proposed harvesting system also dictated, to an extent, which woodlots would have been suitable for harvesting operations. Access to a landing large enough to pile down all of the dead wood was necessary since the chipper was going to be brought on site after the wood was skidded (ie. "cold logging"). Furthermore, access in general had to be fair or better to accomodate both size and weight of the chipper and chip vans. The chipper was capable of chipping 200 m^3 of dead wood per shift or more, and hence

woodlots with less than 500 m^3 of dead wood available were avoided unless they were adjacent to another woodlot containing a satisfactory volume. This approach (500 m^3 per site) would have required moving the chipper about twice per week. Ideally, woodlots with 1000 m^3 of dead wood or more would have been the most suitable. Finally, only clearcuts or partial cuts were given consideration. Removing a small percentage of a stand volume, such as when managing by the selection cutting method, was deemed impractical and slow when using cable skidders to supply the chipper.

DESCRIPTION AND RESULTS

Description of Field Work

4-1 At the beginning of the study markets were located for the wood chips and other products. Harvesting contractors were then contacted and those in Charlotte county expressed a preliminary interest in participating. The next phase was to locate suitable woodlots, cruise and flag them, and then negotiate the job with the contractors. Four different methods used when attempting to locate were:

4-1 (a) Management Plans - Prescriptions for managing some of the woodlots in York, Sunbury, and Charlotte counties were available for locating woodlots. The plans for Charlotte county were four to six years old while those for York and Sunbury counties* were two years old. Information more than two or three years old was not very useful when identifying potential sites. However the plans, together with lists of possible candidates supplied by the Marketing Board, did provide many leads to investigate.

4-1 (b) Advertising - Advertisements were run twice in each of the Fredericton newspapers (Daily Gleaner), the St. Stephen area paper (St. Croix Courier), and a resources monthly (Farm and Forest). As a further measure, 12 short radio spots were aired on CFNB Radio Station. This approach brought forth many inquiries which were acted upon.

* The search was extended to southern York and Sunbury counties.

4-1 (c) Aerial Photos and Maps - Aerial photographs and orthophoto maps were very dated in Charlotte county and of no use in locating dead wood. Cover-type maps were also old. Those in York and Sunbury counties were not screened for sites.

4-1 (d) Word of Mouth - Several woodlot owners heard about the study by this means and contacted the Marketing Board.

Results

4-2 Contact was made with eighty-five woodlot owners and forty-one woodlots were visited and evaluated for their suitability. A further 150 management plans were screened and rejected for various reasons. Only two woodlots were initially recognized as potential sites, however after showing some interest the owners decided not to participate.

There were a number of reasons that lead to the rejection of the various woodlots, and which ultimately forced the termination of the study. The reasons included:

4-2 (a) the dead wood had deteriorated to the point where it could not be skidded to roadside without breaking apart.

4-2 (b) the total volume of dead wood available at a site was too low because the trees were too small, too scattered, or the site area was too small.

4-2 (c) the woodlot owner was dissatisfied with the plan to not pay stumpage for the dead wood. This policy was adopted because of the perceived high cost of harvesting, and the feeling that the removal of dead material from the woodlot was a service to the woodlot owner, since it would reduce fire hazards,

improve operability, and clear sites for planting or other silviculture work.

4-2 (d) access to and into some woodlots was poor and unsatisfactory for the equipment. Furthermore, woodlot owners often didn't want machinery on roads that were in good condition and normally used for small equipment and vehicles.

4-2 (e) terrain conditions sometimes became the deciding factor, and the main concern was poor drainage. These sites would have necessitated harvesting when the ground was frozen, and the time frame for the study didn't allow for this possibility.

4-2 (f) an overriding concern that large equipment would damage both the soil and natural regeneration made many woodlot owners unwilling to participate. The two most suitable woodlots were lost due to this reason.

4-2 (g) a very negative attitude possessed by woodlot owners towards clearcutting or clearing of small patches on their land. Most owners did not want anything but dead or dying trees removed from their property, and in many cases this component of the standing volume was such a small amount of wood that the cutting would have had to be done on a selection basis. Selection cutting, without damaging the remaining crop, was deemed impractical and not cost effective.

4-2 (h) the difficulty in determining what percentage of the dead wood could be utilized for pulp, and the belief that the majority of dead wood to reach roadside could be marketed as second grade pulp, leaving little available for chipping.

4-2 (i) some woodlot owners believe that the best alternative for dealing with stands of dead wood or mixed stands containing dead wood was to let the trees fall down and decompose.

The following summary shows the number of times each of the eliminating site selection factors were encountered amongst the eighty-five woodlot owners that were contacted. As well as those factors already described, some owners gave no specific reason for not being interested in the study - this is indicated in the summary. In most instances there was a primary reason which eliminated the woodlot from further consideration, however there were cases when a number of reasons were evident and these are indicated as secondary factors.

Factors	Factor Frequency	
	Primary	Secondary
1) Wood too deteriorated	22	5
2) Volume too low	18	10
3) No stumpage payment	2	1
4) Access	3	2
5) Terrain	5	1
6) No large equipment	5	11
7) No clearcutting	13	10
8) Pulp percentage high	2	1
9) Let wood rot	2	0
10) Not interested	13	0

The summary also includes woodlots that were considered in the southern part of York and Sunbury counties. When it became evident that sites in Charlotte county were difficult to find, the search was extended and included an attempt to locate a Fredericton market and another contractor. However this approach did not look promising and the study was terminated.

Another alternative was examined. The chipper could not move from one woodlot to another chipping small volumes at each location, but if the wood could all have been piled down in one yard, then it would have paid to move in the chipper. Two problems arose with this option. Trucking dead full-trees on public roads could have been hazardous. There was too great a risk of branches and tops dropping from the load to use conventional trucks, and modifications to a truck were out of the question. The other drawback to this approach was the extra cost added by loading, trucking, and unloading the trees prior to chipping. Since the trucking appeared hazardous and the costs prohibitive, this alternative was not pursued any further.

CONCLUSIONS

The main intent of the study was to demonstrate and monitor the production of 3000 green tonnes of wood chip fuel produced from dead wood on private woodlots. From this viewpoint alone, the study was a failure. The inability to locate private woodlots that were operable within the constraints imposed by the harvesting strategy, forced the termination of the study before any trees were harvested.

Although production, cost and other information were not obtained, many useful observations and conclusions can be drawn. Perhaps the most important of these concerns the condition of the spruce and fir trees in Charlotte county. As the summary showed, woodlots were most often rejected because the wood was too deteriorated or the available volume was too low. It was often difficult to determine which of these two factors was most dominant, except when volume was low due to a small land area. While some woodlots have been more heavily defoliated than others, they appeared in worse condition than had been anticipated. Indeed many stands were wiped out, and owners felt that a study of this sort was five or more years too late.

The fact that a number of owners were against clearcutting (and in some cases any cutting) and others showed no interest in the study, reconfirms some of the findings of the New Brunswick Private Woodlot Resources Study (1983). They found that the York-Sunbury-Charlotte region had the highest percentage of white-collar workers owning woodlots. This group was shown to rank commercial timber production low on their reasons for owning forested land, although

the owners in general for the entire Marketing Board ranked timber production similar to the provincial average. It is possible that a majority of white-collar workers formed the group of woodlot owners contacted during the study. The New Brunswick Private Woodlot Resources Study (1983) also found that for the cumulative percentage of first, second, and third reasons for owning woodlots, timber production at 28.% fell behind firewood (55.0%), satisfaction (54.7%), investment (46.1%), part of farm (39.6%), and first home (33.8%) as a reason for owning a woodlot in York, Sunbury, or Charlotte counties. In view of this, it is not surprising that it was difficult to arouse interest in the demonstration.

RECOMMENDATIONS

It is conceivable that there are woodlots in Charlotte county suited to the strategy that was proposed for this study. Unfortunately the methods used to locate woodlots were not successful even for a trial demonstration and probably would meet with very limited success in a business application. However evidence indicates that the methods used to attract interest and locate sites were not to blame. The overwhelming problem was the conflicting desires and requirements of the contractors and the woodlot owners in relation to the woodlots. This problem has been made obvious by the early termination of the demonstration. It is recommended that no further attempts be made to harvest dead trees for wood chip fuel from private woodlots if large-scale equipment is to be used. The woodlot composition is not right, and the woodlot owners are not supportive of the idea.

Another option that could be attempted is to design and acquire a small to medium-scale harvesting system that is more in tune with the needs of the woodlot owner. Serious drawbacks to such an approach are the capital requirements to start up and the inherent low productivity of the systems. A number of avenues could be explored to raise capital-technology transfer grants or purchasing by woodlot owner groups, and the encouragement of existing contractors to invest capital. Some small equipment is also currently available in the province for rent or contract. Low rates of production could be a plus when starting a business with limited markets, but otherwise have to be contended with when analyzing the costs of small machines. Perhaps a medium-term

assistance program could be developed to encourage wood chip fuel businesses through their early stages. Naturally any commitment of capital funds would have to be preceeded by a serious marketing effort.

Several woodlot owners suggested establishing a wood yard where they could market any dead or scrap wood that was of no use to them. The owners would be responsible for cutting and forwarding the wood to roadside, and then either they could have the wood trucked in or the yard operators could contract out the delivery to self-loading trucks. The cost of trucking plus the cost at roadside would be paid out, preferably with no stumpage. Arrangements could also be made to accept truck loads of pulp rejected at scale gates, and another source of supply might be found in all of the abandoned piles of wood at roadside on large tracts of crown and freehold lands. It might eventually be necessary to have a number of yards in operation, perhaps in Fredericton, Saint John, and St. Stephen, preferably in conjunction with existing yards. One chipper could be moved from one yard to the next as demand dictates. The chipper would preferably be self-loading and in the medium-size class such as the Morbark Super Beever. A chipper about this size can be towed by a five ton truck, doesn't cost too much relative to large chippers, and can produce chips at a respectable rate. Provisions would have to be made either to move the chipper along the wood pile as it worked (they are normally stationary), or a loader would have to move the wood to the machine. Delivery of chips could be contracted out.

Both the small equipment option and the wood yard option would require much preliminary work before any production could begin. A cost-benefit analysis is obviously one necessity, and it might be worthwhile to elicit responses from woodlot owners to the two ideas by means of a questionnaire through the mail. Before any of this work could proceed, a market analysis would have to show that the wood chip fuel could be sold at locations relatively close to each wood yard. These may include pulp mills consuming in excess of mill wastes, existing institutional, commercial and residential users, and hopefully new consumers.

REFERENCES

Arsenault, Frederic J., 1983. Private Woodlots: What Does the Future Hold?, Report of the New Brunswick Private Woodlot Resources Study, pp. 119.

A P P E N D I X

PROPOSAL

The purpose of this project is to demonstrate economic alternatives for the replacement of insect-damaged stands in southern New Brunswick, essentially through using the biomass for energy generation; to enhance the local economy through additional employment in the forest resource sector; to improve the resource by eliminating non-productive trees and simultaneoulsy reducing the fire hazard.

The procedure will be as follows:

1) Select areas, if practical, in 40-hectare parcels based on existing data in resource departments files; examine them on site; delineate the final selection on maps noting stand composition, volumes (living, dead) and estimated yields. This selection of areas would be done by N.B. Department of Natural Resources and the Forest Products Marketing Board in the local area to be considered. This process will be closely monitored by the N.B. Wood Energy Program on behalf of the Energy Secretariat.

2) Tender the areas at a predetermined price per tonne plus 25% (for increased cost of harvesting in damaged stands). This tendering process is to be carried out by the local Forest Products Marketing Board under the terms of an agreement to be set between the marketing board and the Energy

Secretariat. No royalty is to be charged by the land owner. This will serve as his contribution to the project. Cooperation with the landowners must be obtained such that they argee to the harvesting and post harvesting treatment. Tenders are to be advertised for the following components: Felling, forwarding, chipping and transportation. Individuals may tender on each component or the total, but must indicate the partners chosen to complete the operation if they tender on a specific component. The owners are to be given first choice. A tender bid may be considered unacceptable if the price per tonne, exceeds $32.00 at roadside in a van or container.

3) Complete arrangements for sale of the products - pulp chips and hog fuel - to outlets within 100 km. This is to be primarily arranged by the marketing board but may also be integrated with a CREDA biomass combustion demonstration in the local area.

4) Operations should begin on or before May 15, 1984 unless the weather conditions are, by agreement between the contractor and the Energy Secretariat, considered unfavourable. A volume of 3,000 tonnes will be produced. Of this proposed volume 20% will be assumed to be of marketable pulp chip quality

which would be sold for that purpose.
If this harvesting operation cannot be parallelled with a combustion demonstration project under CREDA, the volume harvested would be reduced to 1000 tonnes.

5) Financing for the project will be the responsibility of the contractor with the proviso that product sales will be guaranteed by the marketing board through an agreement with the Energy Secretariat under the CREDA Program. CREDA would provide an estimated $15/tonne for additional biomass production costs above normal operations.

COST SCHEDULE

Harvesting	$45,000
Monitoring and Reporting	$10,000
Information Transfer	$ 5,000
TOTAL	$60,000

Of the project funding allocated, actual expenses totalled $13,791. Since no harvesting took place only monitoring, reporting and information transfer costs were incurred.